39. Hannes Mareen, Johan De Praeter, Glenn Van Wallendael & Peter Lambert

Fast Compression of Watermarked Videos

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Video watermarking is a well-established technology to help identify digital pirates when they illegally re-distribute videos. To securely distribute videos, every person receives a unique, watermarked version of the video. When numerous watermarked versions of a video are created, they should all be compressed before distributing them. Unfortunately, compressing a single video requires a lot of resources, let alone thousands of videos. Therefore, this poster presents a novel method to speed up the compression of watermarked videos. That is, only the unwatermarked video is compressed with a traditional video encoder. Then, the optimal coding decisions from this compressed video are re-used during the compression of the watermarked videos. In contrast, state-of-the-art architectures re-calculate the optimal coding decisions for every watermarked video. Due to a high correlation of the re-used coding information with the optimal coding information, the compression efficiency and watermark robustness decrease only slightly. Most importantly, the proposed fast encoder speeds up the compression process with a factor of about 120. Consequently, video distributors can use the proposed architecture to deliver high-quality watermarked videos on a large scale without requiring an excessive amount of resources.

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FAST COMPRESSION OF WATERMARKED VIDEOS

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What's the problem?

Compressing a video is **complex**: it takes a while.

What if we have **1 000 000** watermarked versions, that each need to be compressed ...?

Compressing all watermarked videos takes way too long!

What is watermarking?

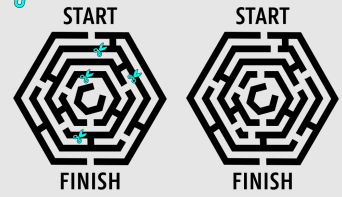
To distribute videos **securely**:

- Every person receives a **watermarked** version of the video.
- If someone leaks their video, he or she can be **identified**.
- The watermark should be robust: not easy to delete.
- The watermark can be invisible or visible.

A simple analogy

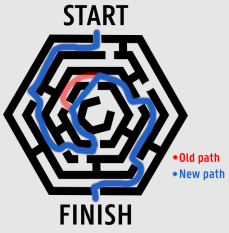
I spent **2 minutes** to find the **shortest path** in this maze:

Now I **cut** some random **openings** in the maze. Can you find a short path in this new maze?



You would just guess the ***same* path**, wouldn't you?
Time needed: **1 second**

The **new shortest path** is actually:

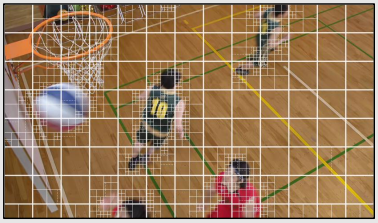


But this took me **2 minutes** again...

The old path was **90% similar** to the new shortest path, but you found it **120 times faster**! Good job!

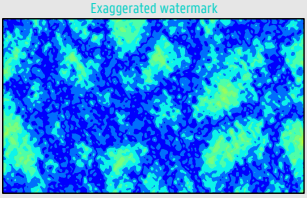
Now with video compression

A video encoder spent **2 minutes** to calculate the **optimal coding decisions** for this video:

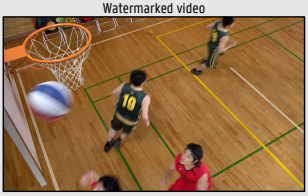


Now I added an **invisible watermark** to the video. Can you find good coding decisions for this new video?

Exaggerated watermark

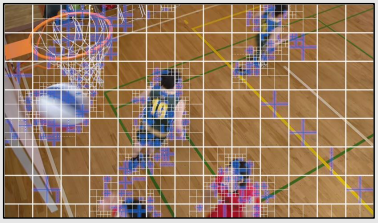


Watermarked video



You would just guess the ***same* coding decisions**, wouldn't you?
Time needed: **1 second**

The **new optimal coding decisions** are actually:



But this took the video encoder **2 minutes** again...

The old decisions were **90% similar** to the new optimal decisions, but you found it **120 times faster**! Good job!

Results

- **Speed-up ≈ 120**
- **Small impact** on quality
- **Small impact** on watermark robustness

Conclusion

Speed up compression of watermarked videos:

- Fully compress **only** the unwatermarked video with a traditional video encoder.
- Then, **copy and paste** the resulting coding decisions to **quickly** compress the watermarked videos.

Ctrl + C

Ctrl + V

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